Better Together: Integrative Analysis of Behavioral Gratitude in Close Relationships using the

Three-factorial Interpersonal Emotions (TIE) Framework

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Abstract

Several lines of research document various relational and personal benefits of gratitude and its key behavioral manifestation, *expressed* gratitude. Integrating these lines, we propose the Three-factorial Interpersonal Emotions (TIE) analytical framework, using two directions of gratitude behavior—expression and receipt of the expression—perspectives of both individuals reporting those behaviors—the acting self and the observing partner—and two temporal scopes to examine gratitude—the dispositional and the situational (operationalized as one's two-week average thanking behavior and daily variations around the average, respectively). These describe eight (2 x 2 x 2) prototypical aspects of behavioral manifestations of interpersonal emotions such as expressed gratitude. We demonstrate the TIE model using a well-powered dyadic daily-diary dataset of naturally emerging gratitude interactions within romantic couples. Results show all aspects of situational gratitude behavior uniquely forecast daily increases in relationship satisfaction; these effects mediate contemporaneous daily increases in life satisfaction, and are not attributable to self-disclosure, fairness, politeness, or general positivity. Alternatively, although they each show a zero-order effect, many aspects of dispositional gratitude behavior do not exert independent effects on relationship or life satisfaction, nor do they hold against the four non-gratitude constructs. Exemplifying the utility of the TIE model, we conclude behavioral gratitude is an *everyday* phenomenon; it comprises related yet distinguishable interpersonal acts, and can be understood from the different perspectives of the actors involved. Methodologically, our work shows the value of bringing relationship-science techniques to study the social functions of emotions, and generates new questions about gratitude in everyday life.

Keywords: Gratitude, Relationships, Emotion expression, Relationship satisfaction, Satisfaction with life

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Notwithstanding some other differences, theories (e.g., Algoe, 2012; McCullough et al., 2008; Watkins, 2004) have unanimously suggested that *gratitude* is an emotion that functions in interpersonal relations. Using diverse methods, empirical studies have supported various beneficial effects of the emotion of gratitude on relationships, for both the grateful beneficiary and the benefactor who induced gratitude (e.g., Algoe et al., 2008; DeSteno et al., 2010; Gordon et al., 2012; Jia et al., 2015; van Baaren et al., 2009). Much of the recent work has further taken advantage of a high-frequency behavioral manifestation of gratitude, its *expression* (e.g., Algoe & Haidt, 2009, Study 1; Chang & Algoe, 2020), which serves as a key mechanism in transmitting the impact of one person's emotion on other people. Here, some researchers primarily consider gratitude as a momentary phenomenon, while others consider its cumulative effects in relationships (see Jackowska et al., 2015; McNulty & Dugas, 2019; Moieni et al., 2019; O'Connell et al., 2017).

Despite the ever-growing body of work, likely because of their differences in theoretical and methodological leanings, existing lines of research on gratitude have seldom been considered together, let alone been integrated; this has created several drawbacks for the understanding of gratitude. Moreover, in the broader emotion literature, because gratitude is so quintessentially interpersonal, arising as a result of another person's actions and triggering a documented suite of interpersonal behaviors back toward that person, gratitude has been a useful *model emotion* to develop and test theories about the social functions of emotions more broadly at the interpersonal (e.g., Algoe et al., 2008; Chang et al., 2013), organizational (e.g., Algoe et al., 2020; Chang et al., 2012), and cultural (e.g., Chang & Algoe, 2020) levels of analysis, with a key contribution being

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empirical documentation of links from one person's emotion to consequences *for a variety of social partners*, rather than studying only the individual experiencing or expressing the emotion.

Theoretically, any emotion—for example anger, sadness, or joy—can be demonstrated or expressed to a social partner, and this signal will shape that partner's thoughts, feelings, and behavior (Algoe et al., 2020; Keltner & Haidt, 1999). In everyday life, these are emotion-fueled social interactions that can and should be examined as *interpersonal processes* (Algoe, 2019). Building on the large body of extant work on gratitude and, importantly, its expression, as well as the rich methods designed to analyze human relationships, we then contribute to the broader emotion literature as well by considering what is and what can be known about how the behavioral manifestation of one kind of emotion—gratitude—plays out between people in everyday life.

Just to name a few gaps in understanding of interpersonal emotion dynamics illuminated by the prior gratitude literature, the gratitude expressed by the beneficiary and the gratitude received by their expression target—the benefactor who caused the gratitude—are naturally two parts of the same gratitude interaction. Between the two social partners, however, researchers usually examine the one closest to their distinct research interests, such as the potential benefits to people who express gratitude, ignoring the other. Further, studies of gratitude commonly conceptualize it as either a short-term experience (with concomitant consequences) or a long-term dispositional *tendency* to feel or demonstrate such an emotion (i.e., the gratitude disposition; McCullough et al., 2004; McNulty & Dugas, 2019), and rarely both simultaneously. Finally, emotions—including gratitude—are probabilistically most likely to happen within the context of interactions with people we know and see every day, that is, within the context of ongoing relationships, rather than with strangers (Berscheid & Ammazzalorso, 2007).

The collective result of these examinations of separate components of everyday gratitude interactions, although helpful for depicting the trees, prevent the field from seeing the forest and how the trees compose the forest of gratitude behavior in ongoing, real-life relationships. Our present work, consequently, aims to bring together several aspects of daily gratitude interactions, by first constructing a theoretical framework—the Three-factorial Interpersonal Emotions (TIE) model—that covers them all at once, and then empirically demonstrating the framework, capitalizing on the methods of relationship science to focus on naturally emerging gratitude behavior between naturally interacting individuals in everyday life.

Gratitude is a Relational Emotion

Regardless of their specificities, theories agree that gratitude is an emotion that mostly if not solely operates in social relations (Algoe, 2012; Algoe et al., 2008; McCullough et al., 2008; Watkins, 2004). People feel grateful for social partners, usually their benefactors who did something generous for them (Algoe, 2012; McCullough et al., 2008; Watkins, 2004). The grateful feelings of the beneficiaries can be expressed to the benefactors through various behaviors (Algoe & Haidt, 2009; Chang & Algoe, 2019; McCullough et al., 2008; Watkins et al., 2006). Oftentimes, the benefactors may subsequently notice the expressions and, through them, the beneficiaries' feelings of gratitude (Chang & Algoe, 2020). Functionally, this perception of the benefactor and the following expression of the beneficiary may reinforce the benefactor's original behaviors toward the beneficiary (McCullough et al., 2001; McCullough et al., 2008) and even amplify the benefactor's overall perception that the beneficiary is responsive to the benefactor as well as the benefactor's own responsiveness to the beneficiary (Algoe, 2012). As a result, the social interactions initiated by experienced gratitude lay the foundation not only for smoother interpersonal transactions (McCullough et al., 2008), but also for stronger communal relations

between the two interacting partners now and in the long run (Algoe, 2012; Algoe et al., 2010; Algoe et al., 2008).

Though all emotions may have social functions (e.g., disgust; Kupfer & Giner-Sorolla, 2017), empirical evidence has been steadily accumulating to suggest gratitude's unique role in *promoting interpersonal bonding*. To name a few pieces of evidence regarding the person who originally evoked the gratitude, it has been found that receiving an expression of gratitude from one's romantic partner forecasts one's responsiveness and commitment to the partner (Gordon et al., 2012), as well as loosens the detrimental association between one's attachment insecurity and lack of relationship satisfaction (Park, Impett, et al., 2019). For the potential expresser of gratitude, early work documented that a new college sorority member's reports of grateful feelings toward a specific sorority sister early on subsequently predicted both partners' satisfaction with their relationship a month later (Algoe et al., 2008), and being randomly assigned to express gratitude increased feelings of communal strength in that relationship (Lambert et al., 2010). Relatedly, experimental induction of gratitude in the laboratory increased participants' communally oriented actions in economic exchanges (DeSteno et al., 2010), as well as their willingness to sacrifice personal interests for the interests of those who they feel thankful for (Kong & Belkin, 2019). In addition, using behavioral mimicry as a marker of one's spontaneous intent to affiliate with the mimicked target (van Baaren et al., 2009), research has shown that receiving an intentional benefit, which elicits stronger gratitude than does an accidental benefit, makes a person imitate their benefactor's subtle behaviors more than does the accidental benefit (Jia et al., 2015). Finally, even beyond the scope of dyadic relationships between a grateful person and their benefactor, emerging evidence suggests that the relationship building function of expressed gratitude may ripple through

the larger group to unrelated observing third parties, with the potential to promote relationships between them all (Algoe et al., 2020; Chang et al., 2012).

Gaps in the Literature

Although past research has bolstered the general idea that social interactions involving gratitude promote relationships for both the gratitude-expressing beneficiary as well as the gratitude-receiving benefactor, to our knowledge, these two partners in the social process of gratitude are traditionally tested separately in empirical studies. For example, consider the aforementioned findings. The experiments of DeSteno et al. (2010), Kong and Belkin (2019), and Jia et al. (2015) are exclusively designed to induce gratitude in a participant, thereby creating a pure beneficiary. Similarly, even though those in the actual relationships observed in the naturalistic longitudinal studies of Gordon et al. (2012) and Algoe et al. (2008) could have been both beneficiaries and benefactors to their relational partners, perhaps at different time points over the study period, Gordon et al. (2012) analyzed romantic partners largely as the recipients of gratitude behaviors, whereas Algoe et al. (2008) focused on (little) sorority sisters mainly as the one experiencing and, therefore, potentially expressing gratitude.

Nonetheless, gratitude expression and perception are naturally two sides of the same coin, two ends of the same relationship in which grateful feelings are expressed by one for the other to perceive. Analyzing one person while omitting the other, therefore, undermines the ecological validity and generalizability of conclusions drawn. Theoretically, this design feature of past research also prevents the researchers from comparing the effects of the two directions of gratitude behaviors: outgoing expression and incoming perception. It is difficult to know, for instance, whether perceiving gratitude as the benefactor who caused the feeling (e.g., Gordon et al., 2012) or expressing gratitude as the beneficiary (e.g., Lambert et al., 2010) more effectively promotes

the person's relationship with their social partner. Here, we use a common method in relationship science, assessing both partners for the same construct (e.g., Bolger & Amarel, 2007; Gable et al., 2003), asking each of them whether they expressed gratitude to their partner *as well as* whether their partner expressed gratitude to them that day. This approach will allow us to investigate, say, whether a person's reports of both expressing and receiving gratitude independently relate to the person's relationship satisfaction.

In addition, not only may examining both partners together help parse out the potentially unique contributions of both directions of one person's gratitude, it may further reveal the influences of seeing relationships from the independent perspectives of both partners. In real-time activities of everyday life, it is possible that one person will say they expressed gratitude but the other does not notice it, or that a benefactor *perceives* a gesture as demonstrating gratitude for their actions, when the grateful person did not report expressing it (e.g., Chang & Algoe, 2020; Gable et al., 2003). In fact, the classic distinction between mundane and psychological realism and the emphasis on the latter over the former in designing experiments (Aronson et al., 1998) exemplifies the consensus among experimental psychologists that it is people's subjective perceptions and interpretations but not the objective construction of the world that propel individuals into movements (or thoughts and feelings). Critically, using dyadic statistical methods, researchers can test the possibility—for example—that Jack's perception of receiving gratitude from Rose predicts *Rose's* relationship quality independent from her report of having expressed gratitude. How could that be? Because gratitude is part of an ongoing interpersonal process, it—and its behavioral manifestations—triggers thoughts and feelings in *each member of the dyad* that can, in turn, shape each person's interpersonal behaviors back toward the other (Algoe, 2012). For example, a recent study documented that *benefactors* who subjectively perceived responsiveness in their

beneficiaries after being thanked by them were subsequently more likely to spontaneously and affectionately touch the beneficiaries in real time (e.g., kissing, leg pats, hand holding; Jolink et al., in press), therefore potentially contributing to *the grateful beneficiaries'* satisfaction with the relationships. In other words, each person in the dyad could be independently contributing to amplified relational consequences for the grateful person as well as for their benefactor. However, prior approaches have not yet been able to parse that potential. Here, because we ask *each person in the dyad* the same questions each day, we can pair their partner's reports on the same day (i.e., did the participant express gratitude to you today, and did you receive gratitude from the participant today). This means that researchers may now investigate whether the effects of one's self-reported gratitude behavior—either expressed to or received from the partner—are unique to the effects of gratitude as seen from the viewpoint of one's social partner. For example, one may ask whether Rose's report of thanking Jack contributes to Jack's positive evaluation of their relationship (a partner-report effect) independently from Jack's own self-report of being thanked by Rose (a self-report effect; see Gordon et al., 2012). Equivalently, one might consider whether Rose's relationship evaluation is influenced by Jack's report of being thanked by her (a partner-report effect), while her own report of thanking Jack—the self-report (a self-report effect; see Gordon et al., 2011)—is controlled for.

Finally, existing research has examined gratitude either as a short-term, situational emotion and emotion-induced action (i.e., experienced and expressed gratitude respectively; Chang & Algoe, 2019; Tsang, 2006), *or* as a long-term, dispositional tendency to experience and express gratitude that differs between people (e.g., the appreciative disposition in relationship, measured by items such as "I often tell my partner how much I appreciate her/him."; Gordon et al., 2012). The distinction implies that behavioral gratitude may also be conceptualized at two different

temporal levels, like many other emotions (e.g., Auerbach, 1973; Neff, 2008), and each level may follow a unique psychological process. For instance, with randomized gratitude inductions, the experiments of DeSteno et al. (2010), Kong and Belkin (2019), and Jia et al. (2015) by definition tap into the kind of gratitude feelings and behavior that are situationally generated over and above individual differences. The studies of Gordon et al. (2012) and Park, Impett, et al. (2019), although without an experimental manipulation, can also be thought of as conceptualizing gratitude as fluctuating situationally—specifically, daily, as in the present research (see Method)—because the participants were assessed every day before bed and their grateful behavior changed from one day to another. By comparison, McCullough et al. (2004) have reported that, even though a person's grateful feelings fluctuate within themselves across time, the feelings can be significantly accounted for by some of the person's personality traits that persist over time (e.g., the Big Five and the grateful disposition; for the grateful disposition, McCullough et al., 2002); this is likely also true for behavioral demonstrations of gratitude. Not only may gratitude behavior be investigated either as a situational or as a dispositional construct depending on researchers' interests; it is *composed* of both and hence can be studied as both simultaneously. In so doing, the present research contributes to the literature by delineating the potential independent effects of the situational (e.g., within-individual across days) and the dispositional (e.g., between-individual) portions of behavioral gratitude on relationships[1].

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[1] We are aware of differences between these operationalizations and what has been done previously in the literature, and therefore advise that readers keep the operationalizations in mind and consider our later discussion about their potential limitations.

A New Way to Consider Daily Dyadic Dynamics of Gratitude and its Behavioral Expression

Combining the two directions of gratitude behaviors—expression and receipt of the expression—the two perspectives of those who observe the behaviors—the acting self and the observing partner—and the two temporal scopes to examine gratitude—the situational and the dispositional—our conceptual analysis above indicates that, in theory, expressed gratitude in people's everyday lives resides in a three-factorial space. In the space, which we refer to as *the Three-factorial Interpersonal Emotions (TIE) framework*, there exist two-directions-by-two-perspectives-by-two-scopes, thus eight distinct aspects (geometrical octants; see Figure 1) of gratitude behavior. As explained in detail in the Discussion, we call the model TIE because, theoretically, it applies to any interpersonal emotion that is expressed by one and received by another, given meaningful outcomes to be predicted.
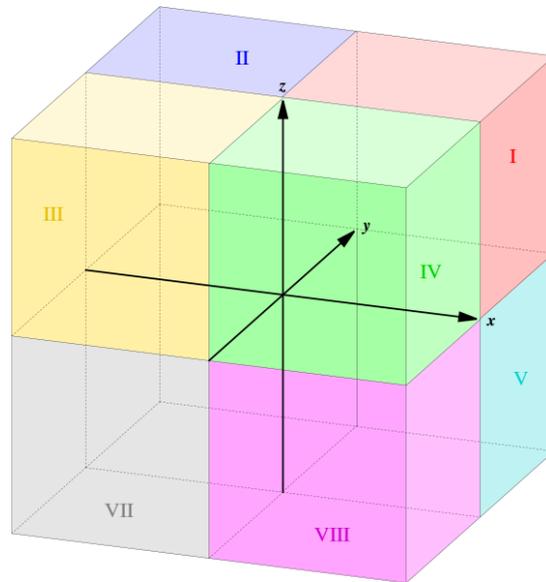
Figure 1. The TIE framework can be used to analyze behavioral gratitude in daily life. The x, y, and z axes represent the three factors of gratitude behavior, composed by 1) the two directions of gratitude behaviors—expression and receipt of the expression (one on the positive and the other on the negative side of the axis, e.g., the x)—2) the two perspectives of those who observe the behaviors—the acting self and the observing partner (e.g., the y)—and 3) the two temporal scopes to examine gratitude—the situational and the dispositional (e.g., the z), respectively. Picking one side from each of the three factors (e.g., an expression, observed by the partner, situationally) creates a three-factorial combination of gratitude behavior that maps onto an octant—one of the colored cubes (e.g., the pink octant VIII, if positive x is for expression, negative y for partner reports, and negative z for the situational scope)—in the conceptual space. (The figure is retrieved from https://commons.wikimedia.org/wiki/File:Octant_numbers.svg on 11/18/2020 under the Creative Commons Zero License.)

Importantly, several of these aspects of expressed gratitude have not been studied in the literature, and certainly have not been studied together so that their effects can be tested against one another. However, the effects are intriguing and may shed light on the nature of gratitude. For example, although most existing research focuses on how gratitude facilitates relationships via the beneficiary's experience and expression (e.g., Algoe et al., 2010; Gordon et al., 2011), emerging evidence now points to the possibility that gratitude may also facilitate relationships via the benefactor's receipt of gratitude (e.g., Algoe et al., 2016; Park, Impett, et al., 2019).

In addition, most of these findings are about "actor effects" following the terminology of the actor-partner interdependence model (APIM; Cook & Kenny, 2005; Manne et al., 2018)—that is, the effects of expressers' self-reports of their expressing gratitude and recipients' self-reports of their receiving gratitude on their own relationship evaluations. In comparison, few tests of partner effects have been documented (except in the study of Park, Impett, et al., 2019, where the authors examine the moderation effect of partner-report expressed gratitude)—the effects of recipients' reports of their expressers' expressing gratitude to them (a partner report) and expressers' reports of their recipients' receiving gratitude from them (a partner report) on the reported targets' relationship evaluation.[2] It is therefore an open question as to whether expressers' expressing and recipients' receiving gratitude, when observed and reported by their partners, promote their relationships as well and, crucially, whether or not these partner effects function

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[2] Our current theorizing owes much to previous research using the APIM statistical approach. Please note, however, that the "actor" and "partner" effect terminology in the APIM means something specific and different than our use of the term "partner" reports in our theorizing and methods of the present paper. In part, this is because our constructs involve enacted behaviors (e.g., thanking) from one partner to another, which adds layers of labeling complexity if one were to use the APIM "actor" and "partner" terminology. Instead, we chose to follow the tradition in survey design, using the terms of "self"- and peer/"partner" reports about the focal behavior.

over and above their self-report effect counterparts. Simply, do Rose's report of thanking Jack and Jack's report of receiving thanks (i.e., the same expression of Rose, but different reporters) contribute to Rose's relationship evaluation independently? Do they contribute independently to Jack's evaluation (same receipt of Jack, different reporters)? Inspired by the large literature demonstrating that viewpoints matter in understanding relationship outcomes (e.g., Gable et al., 2003; McNulty & Dugas, 2019; Visserman et al., 2019), we believe gratitude may also bear a similar perspective effect worth studying given its critical role in close relationships.

The Present Research

The present research aimed to empirically separate the eight aspects of expressed gratitude and then delineate their zero-order (Analysis 1) as well as unique (Analysis 2) effects on potential future relationship building as measured by dyad members' subjective evaluations of their relationship—that is, relationship satisfaction—a focal outcome in the modern literature on gratitude as an emotion (Algoe, 2012). As detailed below, we achieved this by first closely and continuously observing the daily interactions of gratitude between dyadic social partners and then linking their interaction patterns to their relationship satisfaction.

In addition, we examined the association between gratitude behavior and individuals' general satisfaction with life (Analysis 3). This is because satisfaction with life has been an important and well-documented concomitant of relationship functioning (Diener & Seligman, 2002) and of longstanding interest within the broader gratitude literature (Wood et al., 2010). Specifically, gratitude has been consistently found to forecast various indicators of general well-being both within and outside of relationships (Chang et al., 2013; Emmons & Stern, 2013; Jackowska et al., 2015; Lyubomirsky & Layous, 2013; O'Connell et al., 2017; Watkins et al., 2015; Watkins et al., 2003; Zhang, 2020). As such, in addition to proposing and demonstrating the TIE

model, we hypothesized and tested for the first time to our knowledge an indirect effect by which everyday gratitude behavior feeds further to increase individuals' satisfaction with life after first promoting satisfaction with relationships.

Lastly, given the observational-correlational nature of the current study, we investigated whether expressed gratitude's association with relationship satisfaction is reducible to the effects of several other constructs that have been widely studied in the literature, shown to play key roles in relationships, and importantly, may exist as part of the same social process as experienced or expressed gratitude (Analysis 4). Specifically, the selected constructs were politeness (Holtgraves & Joong-nam, 1990), fairness (McCullough et al., 2008), general positive affect in interpersonal processes (Stafford & Canary, 1991; Staw et al., 1994), and interpersonal disclosure (Collins & Miller, 1994); we tested gratitude against these constructs one by one by controlling for their effects. Below we detail the design of our study and how the design helped achieve the aforementioned goals.

Method

We used a daily-diary design to capture dyad members' actual, naturalistic gratitude interactions in daily life, and examined the effects of these interactions on the participants' satisfaction with their relationships with their partners and with their own lives. Specifically, we took the opportunity to combine two similar existing large datasets wherein participants in the source studies were recruited with their romantic partners. The romantic relationship context was convenient and informative for the present investigation, as gratitude expressions appear there often and the members' interactions commonly cover a wide range of real-world matters (Algoe et al., 2010; Gordon et al., 2012; Gordon et al., 2011; Park, Impett, et al., 2019; Visserman et al., 2019).

Participants

The two source studies were approved by the IRB of the University of North Carolina at Chapel Hill and were collected using the same participant recruitment methods in the same geographical area. Participants in the earlier project (run in 2008; individual N = 160; see Algoe & Fredrickson, 2019) did not provide additional nightly reports after the initial two-week study period, whereas those in the later study (run in 2013-4; individual N = 256; see Algoe et al., 2016) subsequently had a laboratory visit where they received an experimental manipulation and then continued the same daily reporting for three more weeks after the two baseline weeks. Here, we only used the data from the initial two non-experimental weeks of both source projects. Assuming no interdependence due to the nested structure of the datasets, a conservative estimation approach, our study design with the combined data then provided a statistical sensitivity (i.e., the smallest effect size to detect; Cohen, 1988, p. 15) of $|\rho| > .14$ at the person level. Given its much larger sample size, the day level data should be much more powerful than this. Lastly, the sample sizes for all variables and all analyses can be found in the supplemental materials.

Among the participants (of both sources combined), 72.90% self-identified as Caucasian, 11.92% were African-American, 3.79% were East Asian, 2.71% were South Asian, and 0.27% were American-Indian or Alaskan-Native. This distribution of ethnicity was not significantly different from that of the U.S. population ($\chi^2 = 3.85$, $p = .426$). As for age, participants ranged from 18—a requirement to participate in the studies—to 61 years old, with a mean of 27.36 ($SD = 8.71$, skewness = 1.86). Reflecting the age variability, the relationship status of participants was diverse, with 0.54% of them dating casually, 56.60% dating exclusively, 7.01% being engaged, 32.08% being married, and 3.77% being in situations not otherwise specified. Similarly, some of the participants had just met their partners and were starting relationships while others had cohabitated

over three decades (M_{year} of knowing the partner = 4.83, *Max* = 35.25, *SD* = 4.42; M_{year} of a romantic relationship = 4.00, *Max* = 35.25, *SD* = 4.25; M_{year} of cohabitation = 2.58, *Max* = 33.17, *SD* = 4.12; all *Min* < 1).

Although the measures and many methodological features of the two studies were the same, given this diversity among participants and that they came from two different source projects, to ensure an appropriate integration of datasets (see Curran & Hussong, 2009), we fit a four-level multilevel null model to each of the variables used in the current research, with daily reports (Level 1) nested in individuals (Level 2) nested in couples (Level 3) nested in one of the two data sources (Level 4).[3] The results showed no significantly larger-than-zero variance at the source level for any variable we included, suggesting that the data did not have to be modeled at that level and could likely be merged directly. Accordingly, we combined the datasets into one single 3-level sample, for which there was a 90.21% procedural compliance rate from participants over the study period ($M_{\#}$ of daily reports = 12.63 out of 14 days, *SD* = 2.55).

Design and Measures

As mentioned, the common design feature of both larger studies was a portion wherein, every day for two weeks before going to bed, both members of the couple independently reported on the variables of interest in an online questionnaire. Overall, we believe the entire nightly reporting was minimally intrusive, as 90% of the reports took participants less than 10 minutes to complete. The items measured are as follows:

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[3] The model would not be saturated when having only two datasets at the fourth level because it was a null model without predictors or random slopes.

Relationship satisfaction. In both source studies, participants answered the question "Today our relationship was…" on a 9-point Likert-type scale for which points 1, 5, and 9 were labeled "Terrible", "O.K.", and "Terrific" respectively. Other scale points only used the numbers.

Life satisfaction. In both source studies, participants indicated their agreement with the statement "Today, I am satisfied with my life." on a 7-point Likert-type scale for which points 1 to 7 were in turn labeled "strongly disagree", "disagree", "slightly disagree", "neither disagree or agree", "slightly agree", "agree", and "strongly agree".

Gratitude interactions. In both source studies, every day, participants reported whether "I [the participant] thanked my partner for something he/she did that I appreciated." that day (self-reported expressed gratitude), as well as whether "My partner thanked me [the participant] for something I did that he/she appreciated." the same day (self-reported received gratitude). Given that the partner of the participant also reported on these same variables—specifically, whether the participant thanked them and whether they thanked the participant—we then paired one's responses with those of one's partner's, creating independent measures of whether the partner indicated that the participant thanked them on a given day (partner-reported gratitude expressed by the participant) as well as whether the partner indicated that the participant was thanked by them the same day (partner-reported gratitude received by the participant). By matching partner responses to the participant's, this nightly questionnaire produced four types of behavioral gratitude, repeated daily, covering the two directions of gratitude—expression and receipt of the expression—crossed by the two perspectives of the two interaction partners. These gratitude behaviors were assessed on a dichotomous scale, with behavior presence coded 1 and absence coded 0. As detailed in the Results, we then statistically decomposed each of the four into a

dispositional tendency and a situational portion, thus creating a measure of each of the 8 aspects of gratitude behavior in the model.

To be clear, because the dependent variables to be predicted by gratitude behavior were the participant's but not the partner's relationship and life satisfaction, we operationalized the various aspects of gratitude behavior from the perspective of the focal participant. That is, as listed in Table 1, the partner's report of being thanked by the participant, despite representing the receipt of gratitude in nature, was deemed "expressed" gratitude of the participant, observed by the partner. Similarly, the *partner's* report of thanking the participant was the participant's "received" gratitude, as reported by the partner. Finally, because the partner was a participant, too, the current multi-level modeling analysis approach also allowed us to include their data, with their satisfaction scores as the dependent variables being predicted.

Table 1.

Mappings of constructs, measures, and variable labels

Construct	Measure	Variable label
The focal participant *expresses* gratitude		
Participant self-report	Participant's "I thanked my partner…"	Self-report expression
Partner report	Partner's "My partner thanked me…"	Partner-report expression
The focal participant *receives* gratitude		
Participant self-report	Participant's "My partner thanked me…"	Self-report receipt
Partner report	Partner's "I thanked my partner…"	Partner-report receipt

Note. The focal participant is the one whose well-being is being predicted.

Lastly, to test the effects of gratitude behavior independent from other positive relationship constructs of interest, namely politeness, fairness, general positive interpersonal processes, and interpersonal disclosure, we identified interpersonal behaviors that were measured in the same format as that of gratitude in either of the two source datasets. If there were multiple items comprising a construct within each dataset, we averaged across them to represent that construct in the analysis. The items are as follows:

Interpersonal disclosure (referred to as "disclosure" when needed). The pair of items were "I talked about my feelings with my partner." and "My partner talked about his/her feelings with me." in the first dataset, and the pair of "I simply told him/her how I felt about our relationship." and "My partner simply told me how she/he felt about our relationship." in the second.

Politeness. The pair of daily items were "I/My partner was very nice, courteous, and polite when we talk." in the second dataset. There was no appropriate item in the first dataset.

Fairness. The two pairs of daily items were 1) "I/My partner helped equally with tasks that need to be done." and 2) "I/My partner did my/his/her fair share of the work we have to do." in the second dataset and, again, there was no measure of fairness in the first dataset.

Positive interpersonal processes (referred to as "positivity" when needed). The five pairs of items were 1) "I/My partner complimented my partner/me.", 2) "I/My partner told my partner/me I/he/she loved him/her/me.", 3) "I/My partner made my partner/me laugh", 4) "I/My partner did things with my partner/me that he/she/I really enjoys.", and 5) "I/My partner did something that made my partner/me happy." in the first dataset. In the second dataset, the four pairs were 1) "I/My partner attempted to make our interactions very enjoyable.", 2) "I/My partner

acted cheerful and positive when with him/her/me.", 3) "I/My partner tried to be romantic, fun, and interesting with him/her/me.", and 4) "I/My partner showed my/his/her love for him/her/me."

Table 2.

Descriptive statistics of the variables analyzed

	Intercept					Level-1 random variance				Level-2 random variance				Level-3 random variance			
	Est.	*se*	df	CI 95%		Est.	*se*	Z	*p*	Est.	*se*	Z	*p*	Est.	*se*	Z	*p*
Satisfaction																	
Relationship	7.27	0.06	192.07	7.15	7.39	1.40	0.03	46.32	.000	0.35	0.05	7.13	.000	0.45	0.07	5.99	.000
Life	5.59	0.05	193.58	5.49	5.70	0.83	0.02	46.49	.000	0.83	0.02	46.49	.000	0.83	0.02	46.49	.000
Gratitude																	
Received	67.90%	0.02	184.51	0.64	0.71	0.15	0.00	46.34	.000	0.03	0.00	6.69	.000	0.04	0.01	5.62	.000
Expressed	77.05%	0.01	183.36	0.74	0.80	0.13	0.00	46.37	.000	0.02	0.00	6.03	.000	0.03	0.00	5.58	.000
Disclosure																	
Received	57.80%	0.02	189.97	0.54	0.62	0.14	0.00	46.33	.000	0.06	0.01	7.91	.000	0.05	0.01	5.03	.000
Expressed	57.64%	0.02	190.91	0.54	0.62	0.15	0.00	46.35	.000	0.06	0.01	7.91	.000	0.04	0.01	4.50	.000
Fairness																	
Received	79.59%	0.02	105.53	0.76	0.84	0.09	0.00	35.82	.000	0.04	0.01	5.87	.000	0.02	0.01	3.38	.001
Expressed	78.96%	0.02	109.44	0.75	0.83	0.09	0.00	35.83	.000	0.04	0.01	5.98	.000	0.02	0.01	2.97	.003
Politeness																	
Received	91.78%	0.01	107.32	0.90	0.94	0.06	0.00	35.81	.000	0.01	0.00	3.64	.000	0.01	0.00	3.87	.000
Expressed	91.54%	0.01	107.47	0.90	0.94	0.06	0.00	35.84	.000	0.01	0.00	4.75	.000	0.00	0.00	1.68	.092
Positivity																	
Received	79.95%	0.01	191.08	0.78	0.82	0.05	0.00	46.40	.000	0.01	0.00	6.10	.000	0.02	0.00	7.69	.000
Expressed	80.16%	0.01	189.34	0.78	0.82	0.04	0.00	46.41	.000	0.01	0.00	7.06	.000	0.02	0.00	6.53	.000

Note. Given data interdependence, the descriptive statistics for a variable are derived in a null-effect multilevel model. The intercept of the model thus represents the mean of the variable, and the variability of the variable is estimated for each level of analysis. Percentages are used for binary, 0 or 1, variables to help with interpretation. The *t*-scores and *p*-values of intercepts are omitted here and shown in Supplementary Table 1, because they are tested against 0 when the mid-points of the scales are not 0.

Results

Preliminary Analysis: Descriptives of Measures

We first checked the distributions of the measures included in the present research. Given that the data were in an interdependent nesting structure, we fit each measure to a null-effect multilevel model (i.e., without any predictor). The intercept of the model thus represents the estimated mean of the measure, and its variability was partitioned and derived for each level of the nesting structure.

As shown in Table 2 (see Supplementary Table 1 for other statistics omitted here), all measures showed decent distributions for analysis. Even though the means of all variables were significantly higher than the mid-points of their scales (i.e., their *CI*s did not cover the mid-points)—likely reflecting the positive and socially desirable nature of the constructs—all but one of the measures varied meaningfully (i.e., significantly) at all levels of analysis (the exception was expressed politeness, which varied significantly at the day and the person level and approached significance at the dyad level). In other words, the data seemed to generally spread out well, covering a reasonable diversity of interaction patterns, and were appropriate for further modeling. Specifically, we note that the means of expressed and received gratitude were about 72.5% ± 5%, indicating that it was common for behavioral gratitude to pause about once every four days between partners, even if it still happened generally regularly. For the two types of well-being, similarly, even though both measures were higher than the mid-points of scales (i.e., 5 for relationship satisfaction and 4 for life satisfaction), the means were still two points away from the upper bounds of scales (i.e., 9 for relationship satisfaction and 7 for life satisfaction), leaving reasonable room to study variability. Consequently, we moved into the main four-stage analysis of the present research.

Analytical Plan

As detailed below in their respective sections, we conducted four sets of planned analyses in SPSS (including mediation analysis by the PROCESS MACRO; Hayes & Rockwood, 2017) on gratitude behavior and satisfaction with the relationship or with life, in a three-level model[4], with daily reports (Level 1) nested in individuals (Level 2) nested in couples (Level 3). All raw estimates can be found in the online supplemental materials (in which Supplementary Tables 2a and 2b contain statistics of predictors—including different aspects of gratitude and control variables— predicting relationship and life satisfaction, respectively; Supplementary Table 3 contains results of the mediation analyses in Analysis 3), and we only provide a visualization of results in Figure 2 in the main text, because otherwise there would simply be too many numbers to show (i.e., 112 estimates and their dfs, ps, CIs, etc.). We hence suggest reading the text below side-by-side with Figure 2 and, if so desired, tables of statistics in the online supplemental materials.

To derive the dispositional and the situational portions of each of the four gratitude items, which are the participant's reports of expressed and received gratitude and their partner's reports of the same variables, we first extracted the two-week long-term average across the study period of each item as the dispositional portion of variance of the type of gratitude that item tapped into, for each participant. We then calculated the four daily deviations around their respective individual-level means to represent situational gratitude that fluctuated from one day to another. (Bryk & Raudenbush, 2002, p. 139). Given that there were four types of gratitude directly

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[4] We did not pursue the common two-level modeling approach developed by Bolger and Laurenceau (2013), because we did not include random slopes—due to relative lack of power to handle the large numbers of predictors and their corresponding slopes and slope covariances—which made the three-level approach possible (Atkins, 2005). Finally, we included a random intercept in which couple was crossed with time to account for within-day interdependence between partners. Readers may find the demonstrative SPSS syntax of our modeling approach in the online supplemental materials.

assessed, the preparation here subsequently generated eight measures, one for each aspect of

gratitude behavior—situational and dispositional—in the TIE model.

Figure 2. Study results. Analogous to the boxplot, each colored horizontal line represents an unstandardized multilevel-regression coefficient of an aspect of gratitude behavior predicting either relationship (shades of red) or life satisfaction (shades of blue). The two dots surrounding a colored line mark the line's 95% confidence interval, and reference lines are provided for coefficient values of 0 and 1. For estimates close to the critical value, sig. and n.s. denote significant and non-significant respectively. From the left, the columns show zero-order effects (Analysis 1), unique effects (Analysis 2), unique effects controlling for the non-dependent satisfaction measure (i.e., mediation, Analysis 3), and then zero-order effects controlling for either interpersonal disclosure, fairness, politeness, or general positive interpersonal processes, respectively (Analysis 4).

Analysis 1: Zero-Order Effects of Gratitude on Relationship and Life Satisfaction

To first delineate the zero-order effect of each aspect of gratitude behavior on relationship and life satisfaction, we fit eight models all following this format:

Level 1 (days): $\text{Satisfaction}_{ijk} = \beta_{0jk} + \beta_1 * \text{Satisfaction}_{i-1,jk} + \beta_2 * \Delta\text{Gratitude}_{ijk} + r_{ijk}$

Level 2 (individuals): $\beta_{0jk} = \beta_{00k} + \beta_{01k} * \text{Gratitude}_{\cdot jk} + u_{0jk}$

Level 3 (couples): $\beta_{00k} = \beta_{000} + u_{00k}$

In this three-level random-intercept model, i designates the day of a daily report nested within a participant, j designates the participant nested within a couple, and k designates the couple. $\text{Satisfaction}_{ijk}$ and $\text{Satisfaction}_{i-1,jk}$ are a focal participant's satisfaction with relationship or with life on a given day and on the prior day respectively. Considering the two days together, we thus derived day-to-day fluctuations in the dependent variable and tested how it tracked and changed with gratitude. Lastly, $\text{Gratitude}_{\cdot jk}$ is the two-week dispositional mean of an aspect of gratitude, and $\Delta\text{Gratitude}_{ijk}$ (= Gratitude_{ijk} − $\text{Gratitude}_{\cdot jk}$) is that aspect's daily situational deviations around the mean. Because these two predictors are orthogonal, we entered them in the same model, once predicting relationship satisfaction, and again predicting life satisfaction. Overall, then, there were eight models for four dispositional-situational sets of a gratitude behavior crossed by two types of dependent satisfaction.

As visualized in the first column from the left in Figure 2 (whose raw statistics are in Supplementary Tables 2a and 2b), the results showed that all eight aspects of gratitude behaviors had significant positive zero-order effects on participants' daily changes in relationship and life satisfaction. The findings therefore conceptually replicated existing research on the effects of self-

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reported situational expressed gratitude (e.g., Gordon et al., 2011) and self-reported situational received gratitude (e.g., Gordon et al., 2012).

In addition, the data extend beyond the literature by pointing to potential novel observations. For instance, we found both *partner*-reported expressed gratitude and *partner*-reported received gratitude at both the situational and dispositional levels positively forecasted the *focal participant's* satisfaction with relationship and with life. That is, when *Jack* reported that Rose thanked him as well as when Jack reported that he thanked Rose, *Rose* reported greater relationship and life satisfaction on that day than on the prior day. It is, however, unclear at this point as to whether these partner-reported effects merely resulted from mirroring their self-reported counterparts of Rose. We address this question in the next set of analyses.

Analysis 2: Unique Effects of Gratitude on Relationship and Life Satisfaction

Elaborating on Analysis 1, here we examined the extent to which each of the eight aspects of gratitude behavior predicts relationship and life satisfaction over and above the others. In terms of modeling, we combined the four zero-order models on the same dependent measure of satisfaction, predicting that satisfaction measure—either relationship satisfaction or life satisfaction, now only one model each—by all eight aspects of behavioral gratitude simultaneously. As in Analysis 1, we again controlled for the dependent satisfaction assessment from the prior day in the current analysis.

As visualized in the second column from the left in Figure 2 (whose raw statistics are in Supplementary Tables 2a and 2b), the results indicated that both directions of gratitude behaviors—expression or receipt—observed from both perspectives in the interaction—self- or partner-reported—positively and, now, *uniquely* predicted both relationship and life satisfaction at the situational level. That is, Rose's increased relationship satisfaction on one day is

significantly accounted for by her own reports of both expressing gratitude to and receiving an expression of gratitude from Jack *as well as* by Jack's reports that she expressed gratitude to him and that he expressed gratitude to her (i.e., she received his gratitude).

At the dispositional level, however, we only found that self-reported received gratitude was independently associated with both types of satisfaction, and that self-reported expressed gratitude was independently associated with relationship satisfaction. In other words, all 8 tests of gratitude at the situational level were significant, but merely 3—all of which were self-reported—showed significant independent effects at the dispositional level. We address this cross-temporal-scope difference in the Discussion.

Analysis 3: Mediated Effects of Gratitude on Relationship and Life Satisfaction

Having illustrated the effects of gratitude behavior on relationship and life satisfaction separately, we next turned to the interrelations among the three. As mentioned above, we hypothesized a mediational chain where gratitude first contributes to relationship satisfaction and subsequently life satisfaction. This was because the primary function of gratitude is to strengthen social relations (Algoe, 2012), which serves as one of the few "basic" prerequisites of individuals' general well-being (Ryan & Deci, 2000).

To test the hypothesis, in the unique-effect model of gratitude (i.e., Analysis 2), we entered same-day satisfaction with relationship as a predictor of satisfaction with life, controlling for prior-day life satisfaction. With model modifications described below, the bootstrapping method was then used to test the mediation hypothesis by constructing the confidence interval of the mediated path from each type of gratitude to life satisfaction. Finally, given the cross-sectional nature of this mediation analysis, to assess the alternative possibility that it is satisfaction with life that mediates satisfaction with relationship, we repeated the above analysis while having both types of

satisfaction switch places, controlling for prior-day relationship satisfaction (which was now the dependent variable).

In line with the hypothesis, as visualized in the third column from the left in Figure 2 (whose raw statistics are in Supplementary Tables 2a and 2b), the results showed that relationship satisfaction significantly predicted life satisfaction in the mediated model (CI $_{95\%}$ = 0.39 ± 0.02, df = 3491.04, t = 30.78, p < .001) and, importantly, washed away the five unique effects of gratitude behavior on life satisfaction found in Analysis 2 (i.e., the four situational aspects of behavioral gratitude and self-reported dispositional received gratitude). By contrast, even though life satisfaction also independently forecasted relationship satisfaction (CI $_{95\%}$ = 0.52 ± 0.03, df = 3070.23, t = 30.37, p < .001), all aspects of gratitude behavior predicted relationship satisfaction as they did without life satisfaction being included as a potential mediator (i.e., all six significant unique gratitude effects from Analysis 2 remained significant).

To formally evaluate these two mediation chains, we adopted a method used in past research (e.g., in Chang et al., 2017) that takes advantage of the fact that models similar to ours do not include a random slope and can in theory be compressed into a single level when the models' random intercepts are estimated (by the best linear unbiased estimator, BLUE) and then removed (subtracted from the dependent variable). The resultant model would then be single-level and suitable for a bootstrapping mediation test, which we applied here with 5k re-samplings.

Following this procedure, as detailed in Table 3 in the online supplemental materials, the results lent support to the hypothesis by showing that relationship satisfaction significantly (i.e., the CIs $_{95\%}$ of the indirect effects of gratitude did not cover 0) and fully (i.e., the CIs $_{95\%}$ of the direct effects of gratitude covered 0) mediated the effects of all five unique effects of gratitude behavior on life satisfaction. In comparison, although it was found that life satisfaction also

significantly mediated portions of the effects of the six aspects of gratitude behavior found to be uniquely predictive of relationship satisfaction (i.e., the CIs $_{95\%}$ of the indirect effects of gratitude did not cover 0), these aspects of gratitude behavior still had significant non-mediated effects on relationship satisfaction when life satisfaction served as a mediator (i.e., the CIs $_{95\%}$ of the direct effects of gratitude did not cover 0 either). In other words, building on Analysis 2, we once again demonstrated that most aspects of behavioral gratitude (e.g., daily changes in Jack's report of whether Rose thanked him) simultaneously and independently predicted increased relationship satisfaction of the focal participant (Rose) on a given day. Extending the contribution, we provide evidence for the theoretically derived hypothesis that this boost in relationship satisfaction feeds forward to the participant's (Rose's) overall well-being that day. Expressing gratitude and receiving gratitude expressions are associated with life satisfaction in intimate relationships likely because of their primary associations with relationship satisfaction.

Analysis 4: Alternative Mechanisms Linking Gratitude to Relationship Satisfaction

In this final set of analyses, we examined the effects of behavioral gratitude on relationship and life satisfaction, controlling for similar potential effects of interpersonal disclosure (e.g. Collins & Miller, 1994), fairness (e.g. McCullough et al., 2008), politeness (e.g. Holtgraves & Joong-nam, 1990), and general positive affect in interpersonal processes (e.g. Stafford & Canary, 1991; Staw et al., 1994). We chose these constructs not only because of the practical opportunities to assess them in the source datasets, but also because of their significance in the literature as common relationship facilitators and the fact that they do seem to be relevant to everyday gratitude interactions. Specifically, the expression of "thank you" often falls in the domain of manners and politeness (Brown & Levinson, 1987). It has also been argued that individuals demonstrate gratitude mostly if not merely to communicate their willingness to maintain fair exchanges of

resources (McCullough et al., 2008). Lastly, as all interpersonal emotion expressions (Graham et al., 2008), gratitude expressions involve disclosure of personal feelings to others, and these feelings are affectively positive in nature (Algoe, 2019; McCullough et al., 2001).

To analyze the data, because each aspect of gratitude behavior had its counterpart of each of the four non-gratitude interaction constructs that we included—for example, "My partner thanked me." (received gratitude) could be paired with "My partner was very nice, courteous, and polite when we talk." (received politeness; see Design and Measures)—we tested each behavioral gratitude variable against each of its non-gratitude counterparts by simultaneously entering both in the zero-order model of the aspect of behavioral gratitude (i.e., the models in Analysis 1). As in Analysis 1, the same analysis was repeated twice, once predicting satisfaction with relationship and once predicting satisfaction with life.

In might be worth noting here that, even though every non-gratitude construct had eight different aspects within it as in the case of gratitude, the eight were in four orthogonal dispositional-situational sets, again as in the case of gratitude (Analysis 1). Consequently, we only used four (not eight) models here. In addition, we focused on zero-order models (Analysis 1) as opposed to unique-effect models (Analysis 2), because the latter would create the possibility that an aspect of gratitude interactions was mediated by a different aspect or the combination of multiple aspects of the added construct. It would be difficult to parse out this kind of entanglement when gratitude and non-gratitude predictors were not clearly paired in the model.

Following the analysis plan, as visualized in the four columns on the far right side of Figure 2 (whose raw statistics are in Supplementary Tables 2a and 2b), the results showed that no alternative non-gratitude construct was able to fully account for the effect of its same-aspect gratitude variable on relationship satisfaction or life satisfaction at the situational level, regardless

of the direction of gratitude behavior–expressing or receiving an expression—and regardless of the perspective from which the behaviors were observed–the participant or the partner. That is, the conclusions of Analysis 1 held for the four situational aspects of gratitude behavior; the findings suggest that situational gratitude behavior is a unique construct relative to interpersonal disclosure, politeness, fairness, and general positive interpersonal processes.

By contrast, at the dispositional level, only self-reported received gratitude remained significantly predictive of both relationship and life satisfaction against all four non-gratitude constructs considered. Also, the effects of dispositional self-reported expressed gratitude were significant on *relationship satisfaction* controlling for any of the four non-gratitude constructs, yet turned non-significant on *life satisfaction* when controlling for positive interpersonal processes (but not interpersonal disclosure, politeness, and fairness). In terms of partner-reported dispositional gratitude—either expressed or received—their effects on participant *relationship satisfaction* remained significant only when controlling for politeness and interpersonal disclosure, with both partner-reported expressed and received gratitude becoming non-significant when controlling for fairness and other positive interpersonal processes. Finally, we found that partner-reported expressed and received dispositional gratitude significantly predicted *life satisfaction* only when controlling for self-disclosure. When fairness, politeness or other positive interpersonal processes were controlled for, partner-reported dispositional gratitude—either expressed or received—dropped to non-significant in predicting the participant's satisfaction with life. Overall, the 32 tests of the various dispositional effects of gratitude behavior indicated that 12 among the 32 tests failed to reach significance. Non-significant results mostly occurred for life satisfaction, suggesting that dispositional gratitude behavior is particularly independent of the four non-

gratitude behaviors when being linked with relationship satisfaction and then seen from the perspective of oneself.

Discussion

We aimed to bring together different traditions in gratitude research, and illustrate opportunities for studying the dyadic social functions of emotions more broadly, by proposing a three-factor model—the TIE model—of everyday emotion interactions in dyadic relations, wherein gratitude behavior between couple members, as an example, is understood by the factors of 1) *direction*—expresser of gratitude or receipt of the expression, 2) *perspective*—the self-reporting actor or their observing partner, and 3) *temporal scope*—short-term situations or long-term dispositions. Based on this model, we examined the eight paths through which behavioral gratitude may contribute to individuals' satisfaction with their close relationships and with their own lives. The results reveal that all eight aspects of gratitude behavior, by themselves, forecast daily changes in satisfaction with one's relationship and with life (Analysis 1). Among these zero-order effects, all four aspects of situational gratitude also independently predict both types of satisfaction (Analysis 2); in contrast, the most consistent findings of independent associations between dispositional gratitude behavior and the outcomes were when the behavior was self-reported by the participant who also reported on the outcomes. Building on these findings, we further found support for our theorized mediational path, whereby gratitude interactions contribute to everyday life satisfaction through increased relationship satisfaction; again, this held for the four situational aspects of gratitude behavior, independent of one another, as well as for gratitude behavior at the dispositional level when being self-reported (Analysis 3). Finally, we tested the effects of behavioral gratitude on change in relationship satisfaction when controlling for other constructs deemed influential in interpersonal dynamics and that may co-exist with gratitude,

namely, self-disclosure, fairness, politeness, and general positively-valanced interpersonal processes. Like the prior analyses, at the situational level, each of the four gratitude measures—self-reported or partner-reported expression, and self-reported or partner-reported receipt—predicted relationship satisfaction above and beyond any of these potential alternative explanations. At the dispositional level, however, significant effects of behavioral gratitude on both types of satisfaction were only fully preserved against the four controlled constructs when being received and self-reported. When the interactions were expressed or partner-reported at this dispositional level, they lost their predictive power (to self-disclosure, fairness, politeness, or positive interpersonal processes) for at least one type of well-being (Analysis 4).

Implications

Using the behavioral expression of gratitude as the vehicle for testing questions about the social functions of gratitude, the present research reveals novel implications for gratitude research, specifically, as well as for the social functions of emotions more broadly. Below, we first focus on implications for the gratitude literature, then turn to considerations for the broader emotion literature.

Gratitude is dynamic. Together, our analyses highlight the *inter*-personal dynamic nature of gratitude in everyday life. On the daily situational level, both expressed and received gratitude are associated with relationship satisfaction, which then fully mediates the effects of gratitude on life satisfaction. The evidence supports the relational account of gratitude (Algoe, 2012) by not only replicating the existing findings that gratitude may enhance relationships for either the expresser (Gordon et al., 2011; Lambert et al., 2010; Lambert & Fincham, 2011) or the recipient of gratitude (Gordon et al., 2012; Park, Impett, et al., 2019; Williams & Bartlett, 2015); gratitude may indeed promote subjective evaluation of relationships from both directions independently and

simultaneously, echoing existing findings that both experiencing and receiving gratitude contribute to sexual communal strength of couple members (Brady et al., 2020). The present work thus implies the value of considering both behaviors of gratitude side by side in research. Finally, there is evidence (see Figure 1; also Brady et al., 2020) that received gratitude—either self- or partner-reported, situational or dispositional—predicts both types of well-being in relationships more strongly than does expressed gratitude. Though not statistically tested, the observation fits with a line of new studies hinting at a similar value of feeling appreciated relative to expressing it (Park, Impett, et al., 2019; Park, Johnson, et al., 2019). We look forward to future investigations that more closely examine this possibility.

Gratitude is subjective. In addition, the present research considers both interaction partners in the same model, illuminating the importance of understanding their unique subjective perspectives in the social process of gratitude. Specifically, even if past research has shown that both self- and partner-reported (received) gratitude may protect the relationship from the detrimental effects of (the receiver's) insecure attachment in romantic relationships (Park, Impett, et al., 2019), it was unclear whether the two partners' reports only mirror each other. That is, are both people reporting on the same objective fact, or does each person's perspective contribute meaningful independent variance?

Addressing this theoretical possibility, the current findings demonstrate that, on the daily level, self- and partner-reported received gratitude are independent from each other in forecasting both types of satisfaction; so are self- and partner-reported expressed gratitude. As far as we know, this is the first piece of evidence of perspective effects of the gratitude process, echoing an analogous phenomenon known as invisible support, where interpersonal support benefits the supported individual only when the supported is unaware of the support and does not report

receiving it. If the support is seen, the effect is gone (Bolger & Amarel, 2007). Here, even though gratitude does not share the drastic change from being beneficial to not so at all when it is seen, our data reveal the potential unique contributions from both the self and the partner. That is, whether Jack perceives the behavior or not, *Rose's* behavior of thanking Jack, reported by herself (i.e., partner-report received gratitude, received by Jack, with or without his awareness) on a given day predict *Jack's* change in satisfaction with their relationship the same day. This might be because people do not merely verbally thank their benefactors (here, their partners) when feeling thankful; they are often capable of communicating gratitude via a wide range of other demonstrations (e.g., Chang & Algoe, 2020). This relational process hence may become similar to that of invisible support, where actual social resources (i.e., support) flow from one to another, contributing to the receiver's well-being despite the receiver's awareness of the process.

Further, it might be worth pointing out that our data only measured *whether* Jack and Rose thank each other, and offered no information about *what* the partners thank one another for if they do. Yet, it is naturally the case that people thank others *for* something, and they may observe the same events from different perspectives. Specifically, theory has argued that the emotion and the expression of gratitude function to build relationships by communicating the interpersonal signal of responsiveness between individuals (Algoe, 2012). That is, Rose bonds with Jack by perceiving his potential as a responsive social partner in his expressions of gratitude to her. What we report in the current research, therefore, echoes the theory when documenting that, indeed, so long as Rose thinks that Jack thanked her (i.e., partner-report expressed gratitude, expressed by Jack), even if mistakenly, she might be more invested in the relationship due to perceived responsiveness in her partner, and that results in Jack's increases in relationship satisfaction. Together, the findings

invite researchers to bring the partner in the social process of gratitude into the scene in order to fully understand gratitude and its social functions.

Gratitude is temporal. The present work also considers the distinction between long-term dispositional and short-term situational gratitude behavior by examining both side by side. This conceptual difference has long existed in the literature, but only a few have tackled it empirically. For example, McCullough et al. (2004) conducted a cross-level analysis of gratitude, showing that dispositional gratitude (similar to an attitude) positively predicts situational gratitude (as an emotion). Elaborating on the finding, Leong et al. (2020) further found that, via increased situational gratitude, dispositional gratitude forecasts marital satisfaction. This line of investigation is critical, as it introduces the idea of dispositional gratitude to the field and then illustrates its link to situational gratitude and relationship quality. Nevertheless, this prior work differs from the present research in that the former focuses on the overlap—the shared variance—between the two scopes of gratitude (McCullough et al., 2004) and, subsequently, the relational benefits attributable to the co-variance (Leong et al., 2020). In contrast, our work focuses more on the uniqueness of the two temporal levels of gratitude as observable behavior in social interactions, in terms of both levels' independent ability to predict well-being in relationships. Here, we discover that only self-reported dispositional received gratitude uniquely predicted both relationship and life satisfaction and only self-reported dispositional expressed gratitude uniquely predicted relationship satisfaction. No partner-reported gratitude construct at the dispositional level significantly forecasted either outcome.

In contrast to the finding that all aspects of gratitude interactions are independently effective at the situational level on both relationship and life satisfaction, the present research then implies that, in terms of dispositional propensity for expressing or perceiving gratitude, couple

members' self-perceptions and their partners' perceptions of them might be fairly aligned and, thus, *statistically redundant* in predicting both types of satisfaction—they are not unique predictors. A possible explanation for this alignment might be that, although everyday interactions between two people can happen quickly and the two might not be able to fully catch up with each other in the short run, thus creating a self-partner independence at the situational level, people may eventually see who their partners are in terms of being a generally grateful or ungrateful person. As a result, unlike the directions of behavioral gratitude (i.e., expression and receipt) that affect well-being independently at the dispositional level, different perspectives from which the expression is seen may not matter that much as compared to their pattern at the situational level.

Finally, it is important to keep in mind that the present investigation operationalized gratitude—both situational and dispositional—based on its (reported) expressed behavior, thanking. The assumption is that people likely demonstrate this kind of behavioral manifestation of gratitude when they feel grateful. This operationalization is not uncommon in the literature and not limited to our team (e.g., Human et al., 2018; Williams & Bartlett, 2015; Zhang et al., 2018). Research has also documented the tight and potentially cross-culturally invariant association between experienced gratitude (i.e., the emotion) and the type of expressed gratitude used in the present investigation (i.e., thanking, the behavior; Chang & Algoe, 2020). However, we acknowledge that thanking does not always follow from sincere thankfulness. This is a major reason why we tested behavioral gratitude (and emphasize that it is behavioral throughout the paper) against the four potential alternative causes of the behavior (Analysis 4), and why it must be pointed out that, specifically at the dispositional level, what we study in the current work is the degree of behavioral consistency in the expression and perception of gratitude. Although statistically probable, this behavior does not always reflect the so-called personality of gratitude

(McCullough et al., 2002). The latter may encompass many related traits (e.g., religiosity; McCullough et al., 2002) other than the behavior studied (specifically, self-report dispositional expressed gratitude, which sits closely with, say, the item "I am grateful to a wide variety of people." in the gratitude personality scale GQ-6; McCullough et al., 2002). Nonetheless, the chosen operationalization does with more recent work that taps into individual differences in the tendency to experience *and express*s gratitude, though that literature does not parse variance between the experience and behavior (Gordon et al., 2012; Gordon et al., 2011; McNulty & Dugas, 2019). As such, we suggest that future research not only consider gratitude in different temporal scopes, but also uses different measures—the experience, the expression, and the perception, and maybe even the lay theory (Lambert et al., 2009)—to triangulate the concept at each of the levels.

Gratitude is multi-factorial, like many other emotions. Considering all findings together, we believe the present research supports the proposal that expressed gratitude in everyday life is a multi-factorial construct. All three factors in the TIE framework—expressed or received, self- or partner-reported, and dispositional or situational—were required to separate the six aspects of behavioral gratitude that showed independent effects on relationship satisfaction in our empirical demonstration. Further, it seems that the two non-uniquely predictive aspects of gratitude interactions—partner-reported dispositional expressed and partner-reported dispositional received gratitude—are also informative given their zero-order effects. Having a generally appreciable (i.e., partner-reported received) and a generally appreciative (i.e., partner-reported expressed) personality acknowledged by one's partner may also have valuable real-world implications for one's well-being, even though these effects might not be as direct and independent as the six unique effects. Together, we hold that the three factors for examining everyday gratitude interactions prove to be both theoretically and practically useful.

Indeed, we believe that the TIE analytical framework may generalize beyond gratitude to any emotion expressed from one person to their social partners. For example, it is no secret that people commonly demonstrate their anger (e.g., Marsh et al., 2005), sadness (e.g., Hackenbracht & Tamir, 2010), amusement (e.g., Keltner, 1995), and many other emotions to social partners (for reviewes, see Niedenthal & Brauer, 2012; Van Kleef et al., 2010). Moreover, people regularly perceive emotions in expressers and shape their behavior toward those expressers as a result, even if they are not the intended expression targets (Algoe et al., 2020). Here, behavioral demonstrations of some emotions would be harder to notice than others, thus requiring the perspective factor of our proposed framework to analyze. At the same time, some individuals might be more constantly, say, joyful, while others are only occasionally so. That is, for the former joy is relatively dispositional, while for the latter it is situational. Lastly, one can study both the expresser and the recipient of all of these social emotions. When the outcome to be predicted by emotion expressions should be appropriate to the theorized social function of that particular emotion, the three factors of the direction, the perspective, and the temporal scope of the expressions may then reveal their unique utility and—we hope—insights into the roles of emotions in human relations.

Alternative explanations. Although our predictions were generated from theory about the emotion of gratitude, because we operationalized our investigation using a social behavior, we focused on other social behaviors that could provide alternative explanations for our proposed effects. Specifically, the current research considered the associations between behavioral gratitude and several relationship constructs that have been extensively studied and shown to facilitate social relations, namely interpersonal disclosure (Collins & Miller, 1994), fairness (McCullough et al., 2008), politeness (Holtgraves & Joong-nam, 1990), and general positivity (Algoe et al., 2010; Stafford & Canary, 1991; Staw et al., 1994). As discovered, situational gratitude interactions—

both the expression and the receipt, self- and partner-reported—uniquely predict relationship and life satisfaction, over and above all of these non-gratitude constructs. We believe this set of findings is the first to pit gratitude against these selected alternative explanations (in addition to some others considered by Park, Impett, et al., 2019; the authors find gratitude to be unique, too) in a naturalistic setting in terms of how behavioral gratitude forecasts relationship satisfaction, thus shedding light on the special roles of everyday expressed gratitude in relationships, as well as the overall importance of considering the role of emotion expression in relationship science.

Limitations and Future Directions

Regardless of its strengths, the present research is not without limitations. For one, the present research applied a daily-reconstruction design, which made the data—nightly reports— possible to vary from one day to another and, consequently, the variation to be studied. Although not entirely eliminated, the memory biases common in traditional, overall, impression-based scale measures—e.g., that of the gratitude disposition (Leong et al., 2020; McCullough et al., 2002)— were likely reduced by the daily report. Nonetheless, we collected no information about what people thanked their partners for and what their partners thanked them for. It might thus be possible that, even if someone reported having thanked their partner and the partner reported having been thanked by them, the two individuals were in fact thinking and reporting about different events. To address this potential limitation, we believe that studying real-time expressions of gratitude, such as in a laboratory setting, would provide valuable complementary evidence to our current work (e.g., as in Don et al., in press).

Relatedly, readers are advised to carefully and closely interpret the gratitude behavior assessed in the current study along the actual measure used—that is, as *daily checkpoints* of whether the behavior happened on a given day. Here, of course, we believe that these daily effects

are worth interpreting, as daily reconstruction is not only a research method but also a common behavior—many individuals have the habit of writing diaries (reconstructing their days). Evidence that one's partner's gratitude dairies forecast one's well-being independently of one's own diaries has—to our knowledge—never been documented before and, consequently, is something that invites further investigation (e.g., into the possibility of merging these dyadic diaries into existing gratitude interventions; Chang et al., 2013; Diebel et al., 2016; Emmons & Stern, 2013; Lomas et al., 2014).

Related to this future direction is the fact that we did not experimentally test the causal effects of gratitude behavior, even though we estimated the fluctuations in daily satisfaction with relationship and with life in a within-person quasi-experimental fashion. Consequently, future investigations might want to address this issue of causality, again, using experimental methods, either in or outside of the lab.

In addition, we operationalized gratitude based on its observable behavioral manifestations. On the one hand, it might not be controversial to suggest that people show the behavior in the moment (e.g., on the given day) primarily because they feel the emotion. If they do so regularly (e.g., for two weeks), they may also bear the so-called gratitude personality (McCullough et al., 2002). On the other hand, the behavior is by definition different from the emotion no matter how tightly associated; people clearly periodically thank others due to, say, mere habit or manners (Floyd et al., 2018), and it is certainly possible to experience gratitude without expressing it to the benefactor. The long-term behavioral propensity of thanking may reflect mere social rituals as opposed to one's personality, as well (Simpson et al., 2017). Therefore, an important direction for future research will be to examine these social gratitude-expression processes with subjective measures of gratitude emotion and personality.

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Lastly, although we hypothesized mediation, it was not anticipated that all independent effects of gratitude on life satisfaction would be *fully* mediated (i.e., without a significant direct effect left) by relationship satisfaction (Analysis 3). We suspect that the findings resulted partially from the fact that we studied gratitude in intimate relationships and, hence, may have magnified the relational effects of being grateful relative to non-relational ones (e.g., also being optimistic; McCullough et al., 2002). It is also always possible that one fails to detect a direct effect simply due to a lack of power—non-significance (of a direct effect) does not prove (its) non-existence. Nonetheless, we believe what can be concluded from the data is still that, given our research context, design, and measures, expressed gratitude does seem relatively more closely related to relationship satisfaction than life satisfaction, and it forecasts the latter mostly through the former. Future research should consequently scrutinize this conclusion in more diverse domains of life and more statistically powerful designs to see whether similar effects of gratitude are found.

Conclusions

Gratitude has long been theorized as an emotion that functions mainly if not solely in the context of interpersonal relations (Algoe, 2012; McCullough et al., 2008; Watkins, 2004). Empirical evidence has also been accumulating for various relational benefits of expressing gratitude in everyday life. Nevertheless, previous lines of literature on gratitude have been seldom considered alongside one another, let alone integrated, creating several drawbacks for the field's understanding of the emotion, its behavioral manifestations, and their impacts. Addressing these gaps, the present research showcases the added value of using the theories and methods of relationship science to increase the understanding of the dyadic social functions of emotion expression in general, and of the expression of gratitude in particular. At the same time, the investigation provides an important theoretical bridge between the literature on gratitude as an

emotion, which often examines social consequences, and that on gratitude as cumulative experiences—either as a disposition or intervention—which often examines well-being outcomes; this is achieved by incorporating a dispositional perspective and testing a theorized mediational pathway between gratitude and life satisfaction, via boosts in relationship satisfaction. With the proposed TIE framework as well as novel findings, we believe that the current research generates new avenues of inquiry regarding everyday gratitude interactions, for both social partners involved, and hope that the work continues to invite attention to the emotion of gratitude, its behavioral manifestations, and their social consequences.

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